Speed Control of DC motor using PWM Technique

Arpit Harsh Lakra, Nishit Singh Gaur, Abhishek Kumar

ABSTRACT

The project shows a closed loop system for controlling of speed of a DC motor using Pulse Width Modulation technique. In new generation the power semiconductor devices have completely renovated the control of drives, switches etc.

The digital circuit can be interfaced to microcontroller. So that the speed can be controlled by Micro-Controller making speed control device of DC motor even more easily. Pulse Width Modulation technique to the digital circuit drives the component which simultaniously changes the speed .

INTRODUCTION

In today's industrilized era there are increased demand in automation in all sectors.

because Automation gives better quality, results in increased production and also cost efficient.

The variation in speed which controls the speed of motors, are essential controlling elements in automation industry.

Depending on the appliance or application, few have constant speed and some have variations in their speed.

Some decades back the variable speed of motors had certain limitations i.e. less efficiencies, reqirement of large space, lower speed, etc.,

However, new power electronic devices such as power MOSFETs, IGBTs etc., and also micro-controllers many features on the same silicon wafer, changed the scene and today we can have variable speed with controlled loop system which are smaller, more efficient, more reliable and could be modified to meet all the demands of the clients of modern era.

Direct current (DC) motors is been used in variation of speed for a long period of time. The fact that a dc motor has versatile characteristics could provide more starting torque which are required in traction drive. One's Control over speed range, both above and below the rated speed should easily be achieved. The method of speed control are simple and more cost effective than those with alternating current motors.

There are various technique for the speed control of DC motor. The one with the phase control method is usually adopted, but has certain limitations. it mainly generates harmonics on the power line and it also has got p .f when operated at lower speeds. The second method is pulse

width modulation technique, which has got better advantages over the phase control.

In this project, the Pulse Width Modulation Technique is used.

LITERATURE SURVERY

“Gopal K Dubey “Fundamentals of Electric Drives” Narosa Publishing House New Delhi, 1989.”. A work of which provides with a breif knowledge of electrical drive(motors and its controlling etc.)

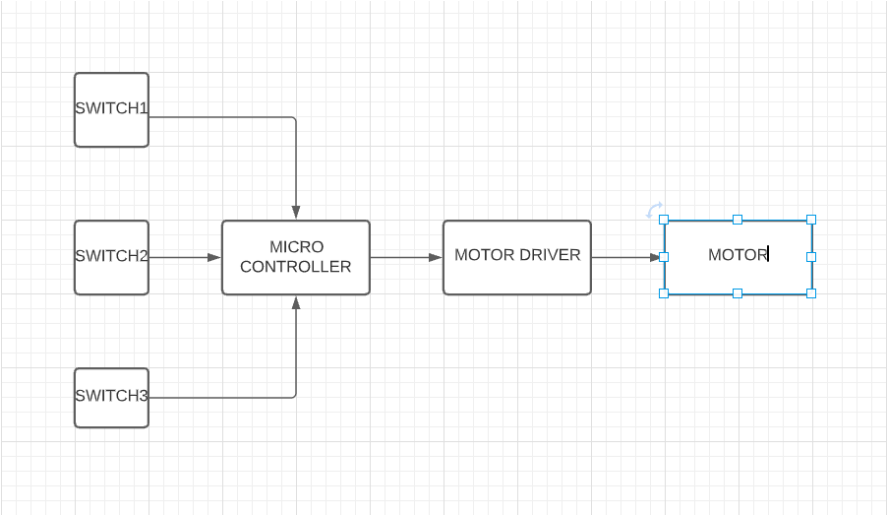
3. Kumara MKSC, Dayananda PRD, Gunatillaka MDPR, Jayawickrama SS, “PC based speed controlling of a dc motor”, A fmal year report University of Moratuwa

Illiniaus USA, 2001102.

4. J Nicolai and T Castagnet , “A Flexible Micro controller Based Chopper Driving a Permanent Magnet DC Motor”, The European Power Electronics

Application. 1993 a review on to how a micro controller is useful for the control of speed in a motor.

BLOCK DIAGRAM



EXPLANATION:

Pulse width modulation (PWM) or duty-cycle variation methods are commonly used in speed control of DC motors. The defination of duty cycle is the ratio of percentage of digital high to the digital low plus digital high .Fig . 1 shows the 5V pulses with 0%through 50% duty cycle .The average DC voltage value for0% duty cycle is zero; with 25% duty cycle the average value is 1.25V (25%of 5V). With 50% duty cycle the average value is 2.5V, and if the duty cycle is 75%, the average voltage is 3.75Vand so on. The maximum duty cycle which can be achieved can be 100%, which is identical to a DC waveform.

Thus by varying the width of pulse generated, we can control the average voltage across a DC motor and hence its speed .The circuit of a speed controlled DC motor should be used in tape recorders and toys.

CONCLUSION:

The dc motor speed is controlled by using power electronic converter circuit. The Pulse Width Modulation technique is used in controlling of speed of a d.c. motor. The closed loop control systems is being used for controlling of pulse width. the circuit is useful for operation of the dc motors at required speed.The circuit response time is too low. Hence high reliability can be achieved. The designed power electronic circuit was tested for various speed input satisfactorily.

IMPLEMENTATION.

REFERENCES

1.Gopal K Dubey “Fundamentals of Electric Drives” Narosa Publishing House New Delhi, 1989.

2. Kumara MKSC, Dayananda PRD, Gunatillaka MDPR, Jayawickrama SS, “PC based speed controlling of a dc motor”, A fmal year report University of Moratuwa

Illiniaus USA, 2001102.

3. J Nicolai and T Castagnet , “A Flexible Micro controller Based Chopper Driving a Permanent Magnet DC Motor”, The European Power Electronics

Application. 1993